We claim:

1. An optical crossbar switch comprising:

an optical crossbar having a plurality of inputs and outputs for reconfigurably coupling the inputs to the outputs;

a lasing SOA coupled to an input of the optical crossbar for amplifying an optical signal, wherein the lasing SOA outputs a ballast laser signal which acts as a ballast with respect to amplification of the optical signal;

a monitor circuit coupled to receive the ballast laser signal from the lasing SOA for generating an electrical signal from the ballast laser signal, the electrical signal containing addressing information for the optical signal; and

a processor coupled to the monitor circuit and the optical crossbar for reconfiguring the optical crossbar according to the addressing information.

2. The optical crossbar switch of claim 1 further comprising an optical buffer coupled between the lasing SOA and the optical crossbar, the optical buffer adapted to store data within the optical signal.

3. The optical crossbar switch of claim 2 wherein the optical buffer comprises a plurality of optical flip-flops.

4. The optical crossbar switch of claim 3 wherein each optical flip-flop in the plurality of optical flip-flops stores a state within the optical signal.

5. The optical crossbar switch of claim 3 wherein an optical flip-flop in the plurality of the optical flip-flops comprises:

a first lasing SOA coupled to an optical flip-flop set interface;

a second lasing SOA coupled to the first lasing SOA and an optical flip-flop reset interface, wherein a state on the optical flip-flop is controlled by the set interface and the reset interface.

6. The optical crossbar switch of claim 1 further comprising an electrical buffer coupled to the lasing SOA and the optical crossbar.

7. The optical crossbar switch of claim 6 wherein the electrical buffer comprises:

a first optical-to-electrical converter coupled to an output on the lasing SOA, the optical-to-electrical converter adapted to covert the optical signal to an equivalent electrical signal; and

an electrical buffer coupled to the first converter and the optical crossbar, the electrical buffer adapted to store the equivalent electrical signal; and

an electrical-to-optical converter coupled to the electrical buffer, the electrical-to-optical converter adapted to convert the equivalent electrical signal to the optical signal.

8. The optical crossbar switch of claim 1 further comprising a signal-shaping device, coupled to the monitor circuit and the processor, that clarifies digital data within the electrical signal.

9. The optical crossbar switch of claim 8 wherein the signal-shaping device comprises a Schmitt trigger.

10. The optical crossbar switch of claim 1 wherein the lasing SOA is a vertical lasing SOA.

11. The optical crossbar switch of claim 1 wherein the lasing SOA is a longitudinal lasing SOA.

12. The optical crossbar switch of claim 1 wherein the at least one lasing SOA is a transverse lasing SOA.

13. The optical crossbar switch of claim 1 wherein the detector comprises an avalanche photodiode.

14. The optical crossbar switch of claim 1 wherein the monitor circuit comprises a PIN diode.

15. The optical crossbar switch of claim 1 wherein the monitor circuit is integrated on a ballast laser light-emitting surface of the lasing SOA.

16. The optical crossbar switch of claim 1 wherein a plurality of channels is in the optical signal and at least one channel contains routing information.

17. The optical crossbar switch of claim 16 wherein the routing information within the optical signal is contained within a single wavelength band.

18. The optical crossbar switch of claim 1 wherein the processor and the optical crossbar switch are integrated on a single chip.

19. The optical crossbar switch of claim 1 wherein the optical crossbar comprises a plurality of optical nodes wherein at least one optical node is used to reconfigurably create a path between an input and an output on the optical crossbar.

20. The optical crossbar switch of claim 1 wherein the at least one optical node comprises:

an optical wavelength demultiplexer for dropping an optical channel from the optical signal;

an optical amplifier coupled to the optical wavelength demultiplexer for amplifying a dropped channel; and

an optical combiner coupled to the optical amplifier for combining the dropped channel onto an output on the optical crossbar.

21. The optical crossbar switch of claim 20 wherein the optical channel comprises a plurality of wavelengths.

22. The optical crossbar switch of claim 20 wherein the optical amplifier within the at least one optical node activates an output in the optical crossbar for the dropped channel.

23. The optical crossbar switch of claim 1 wherein the at least one optical node comprises:

an optical splitter for diverting a portion of the optical signal towards a particular output on the optical crossbar;

an optical amplifier coupled to the optical splitter for amplifying the diverted optical signal; and

an optical combiner coupled to the optical amplifier for combining the diverted optical signal onto an output on the optical crossbar.

24. The optical crossbar switch of claim 23 wherein the optical splitter comprises an integrated tap coupler.

25. The optical crossbar switch of claim 23 wherein the optical amplifier within the at least one optical node activates an output in the optical crossbar for the diverted optical signal.

26. An optical signal switching system comprising:

an optical crossbar having a plurality of inputs for receiving optical signals and a plurality of outputs for transmitting optical signals;

a plurality of optical nodes within the optical crossbar, the optical nodes adapted to control an optical path from an input to a corresponding output;

a plurality of lasing SOAs coupled to the plurality of inputs wherein at least one lasing SOA is coupled to an input;

a plurality of monitor circuits coupled to the plurality of lasing SOAs wherein at least one monitor circuit is coupled to a lasing SOA; and

a plurality of buffers coupled to the pluralities of inputs and lasing SOAs wherein at least one buffer is coupled between a lasing SOA and an input.

27. The optical signal switching system of claim 26 wherein the plurality of buffers comprise optical buffers.

28. The optical signal switching system of claim 26 wherein the plurality of buffers comprise electrical buffers.

29. The optical signal switching system of claim 26 wherein the plurality of lasing SOAs comprises a vertical lasing SOA.

30. The optical signal switching system of claim 26 wherein the plurality of lasing SOAs comprises a transverse lasing SOA.

31. The optical signal switching system of claim 26 wherein the plurality of lasing SOAs comprises a longitudinal lasing SOA.

32. The optical signal switching system of claim 26 wherein the plurality of monitor circuits comprises an avalanche photodiode.

33. The optical signal switching system of claim 26 wherein the plurality of monitor circuits comprises a PIN diode.

34. The optical signal switching system of claim 26 wherein at least one monitor circuit of the plurality of monitor circuits and at least one lasing SOA of the plurality of lasing SOAs is integrated on a single chip.

35. The optical signal switching system of claim 26 further comprising a processor coupled to at least one monitor circuit and at least one optical node, the processor adapted to create a path through the optical crossbar in response to an electrical signal received from the monitor circuit.

36. The optical signal switching system of claim 35 further comprising an optical shaping device, coupled to the at least one monitor circuit and the processor, that clarifies digital data within the electrical signal.

37. A method for switching an optical signal, the method comprising the steps of:

receiving an optical signal in a lasing SOA;

emitting a ballast laser signal from the lasing SOA in response to the received optical signal;

converting the ballast laser signal to an electrical signal;

creating a path through an optical crossbar in response to the electrical signal; and

transmitting the optical signal along the created path through the optical crossbar.

38. The method of claim 37 further comprising the step of storing the optical signal as the path through the optical crossbar is created.

39. The method of claim 38 wherein the optical signal is stored in an optical buffer.

40. The method of claim 38 wherein the optical signal is stored in an electrical buffer.

41. The method of claim 40 wherein the step of storing the optical signal comprises:

converting the optical signal to an electrical signal;

storing the electrical signal in an electrical memory device; and

converting the stored electrical signal to an optical signal after the path through the optical crossbar is created.

42. The method of claim 37 wherein the lasing SOA is a vertical lasing SOA.

43. The method of claim 37 wherein the lasing SOA is a transverse lasing SOA.

44. The method of claim 37 wherein the lasing SOA is a longitudinal lasing SOA.

45. The method of claim 37 wherein a routing channel within the ballast laser light is converted to an electrical signal.

46. The method of claim 37 wherein the step of creating a path through an optical crossbar in response to the electrical signal, further comprises:

diverting a portion of the optical signal onto a different path at an optical node;

transmitting the diverted portion of the optical signal on the different path by activating an SOA; and

outputting the diverted portion of the optical signal from the different path.

47. The method of claim 46 wherein the diverted portion of the optical signal is a dropped channel.